

[54] **SEALING APPARATUS FOR CONTINUOUS MOVING WEB**

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 [51] **Int. Cl.²** **C23F 1/02**
 [58] **Field of Search** **156/16, 345, 18, 8**

[56] **References Cited**

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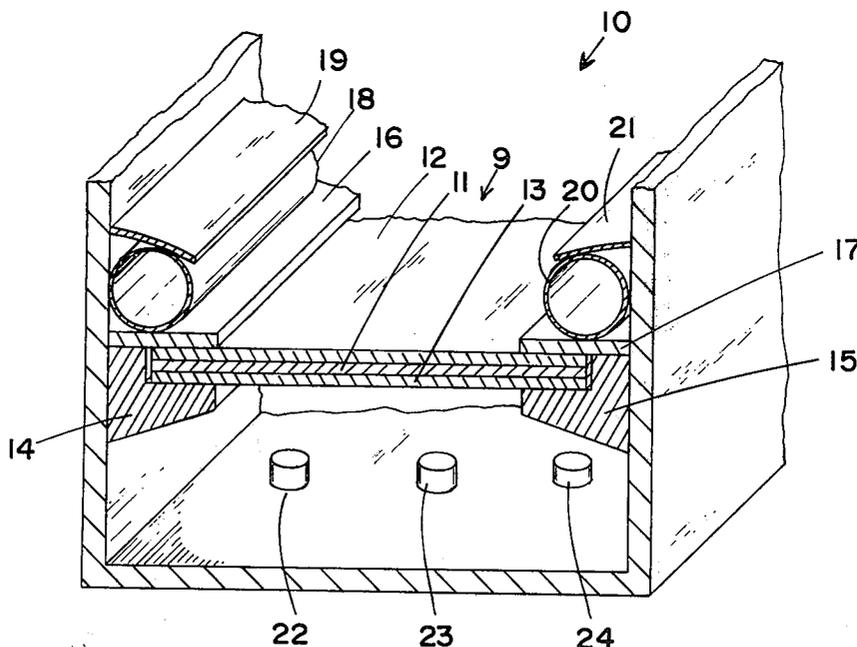
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[57] **ABSTRACT**

An apparatus is provided for forming a seal around the opposite edges of a resist covered web which passes through a spray etchant chamber where etchant is sprayed on one side of the web while the opposite side of the web is protected from etchant spray and fumes by an edge sealing apparatus that utilizes an inflatable air bag to maintain a constant sealing force along the edges of the web.

5 Claims, 2 Drawing Figures



SEALING APPARATUS FOR CONTINUOUS MOVING WEB

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention generally relates to an apparatus for use in spray etching systems and, more particularly, to apparatus for forming sealing engagement along the edges of a continuously moving web and thereby isolate one side of the web from the opposite side of the web while etchant is being applied to one of the sides of the web.

The present invention has its greatest utility where one side of an article is to be etched followed by a later step of simultaneously etching the article on both sides.

2. Description of the Prior Art

In a colored television picture tube, a shadow mask or aperture mask is located between the electron guns at the rear of the tube and the phosphor coated faceplate to the face of the tube. An electron beam passes through the tiny openings or apertures in the shadow mask and impinge upon a suitable color producing phosphor dot on the faceplate. Located along with openings on the shadow mask are three phosphor dots, a triad, one dot for each of the three primary colors. During operation of the picture tube, the shadow mask openings are used as a guide for the electron beams. Thus, one of the uses of the present invention is for an apparatus for manufacturing of the shadow mask for use in the television tubes. Typically, the manufacture of these masks require etching of small holes in a web that travels through a plurality of etching stations. However, one of the problems in making small holes or apertures in thick materials is that it is impossible to accurately etch an opening with a minimum dimension less than the thickness of the material. Conventional etching techniques of etching on both sides generally produces over-etching as well as irregular etching. Over-etching or irregular etching is produced by the lateral etching of the material that inherently accompanies etching perpendicular to the surface of the material. Consequently, the process of accurately making holes having a minimum dimension less than the thickness of the material is a difficult task. The task is even more difficult when applied to the continuous production of etched materials. One such process is shown for making small holes in the patent application of John J. Frantzen and Lee C. Barton titled "Etching Process for Accurately Making Small Holes in Thick Materials," U.S. Pat. Ser. No. 487,665, filed July 11, 1974. In the aforementioned application a reusable shield is placed over the entire top side of the resist cover web and is used as a physical barrier to prevent the etchant fumes from attacking the exposed portion of the web. In this prior art embodiment the shield travels with the web. The present invention in contrast eliminates the need for a traveling physical barrier by use of an edge sealing apparatus that seals off or isolates one side of the web from the opposite side of the web as the etchant resist covered web travels through a spray etching chamber. As can be expected, one of the problems overcome by the present invention is the difficulty in obtaining a seal around a moving web. In addition, this problem is compounded by the fact that the web has a layer of resist on both sides which must not be flaked or peeled off by the sealing apparatus.

BRIEF SUMMARY OF THE INVENTION

Briefly, the present invention comprises an apparatus for sealing around the edges of a continuously moving resist covered web without stripping the resist from the web. The apparatus comprises a pair of edge support guides and a pair of elongated air inflated bags that provide a constant force to hold a pair of pliable sealing members in a sandwich sealing arrangement along the edges of the web.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a cross section elevation view of the web sealing apparatus; and

FIG. 2 is a schematic view of an etching system employed in the apparatus of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, reference numeral 10 generally designates the edge sealing apparatus of the present invention. Located within the apparatus 10 is a continuously moving web 9 which is comprised of three portions, a metallic core 11, a top resist layer 12 and a lower resist layer 13. In actuality resist layers 12 and 13 have a myriad of openings or predetermined regions located therein where one is to etch away material to produce the desired openings or apertures. However, in the initial stages of the etching, it is desired only to etch from beneath or below web 9 by use of etchant spray nozzles 22, 23 and 24. Consequently, it is desired to prevent any etchant from spraying or leaking around to the top side of web 9. If etchant spray or fumes should come in contact with the opposite side of the web, one would produce pre-etching which would make it impossible to accurately etch out the openings of the final etching step. Accordingly, to prevent the leakage of etchant fluid or etchant fumes around the edges, there are provided a pair of support guides 14 and 15 which the edges of the web 9 rest on. Other suitable rollers (not shown) support the center of web 11. Located on top of guides 14 and 15 are a pair of elongated sealing members 16 and 17 which are fastened to chamber 10 but can freely contact the top edge of web 9. Sealing members 16 and 17 are relatively thin flexible sections to enable the force from the air bags to be uniformly transmitted to the edges of the web. Any number of materials are suitable, however, self-lubricating sealing members of polytetrafluoroethylene are preferred because of wear resistance and ability to withstand attack from the etchant fluid. Located immediately on top of sealing member 16 is an inflatable air bag 18 which is held in place by a curved mounting fixture 19 which is mounted on the side of the etching chamber. Similarly, located on the opposite side of the etching chamber and on top of guide 17 is an inflatable air bag 20 which is held in place by a curved mounting fixture 21.

It is these two air bags which have been found to enable one to equalize and distribute the forces evenly along opposite edges of the web so that sufficient force is provided to seal the edges of the web so that etchant spray or fumes cannot leak past the edges of resist coated web 9. In addition, it will be appreciated that by controlling the air pressure one can accurately and precisely control the forces on the edge of the web. This feature is important in order to prevent the forces from becoming sufficiently great so as to strip or peel

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the etchant resist layers 12 and 13 located on opposite sides of web 11.

Referring to FIG. 2, reference numeral 30 designates an etching system for use with the present invention. Etching system 30 contains a first set of etching chambers 31, 32, and 33 and a second set of etching chambers 34, 35, 36 and 37. Etching chambers 31, 32, 33, 34 and 35 respectively contain a set of etching nozzles 50, 51, 52, 53 and 54 which are located beneath the article to be etched. In contrast, etching chambers 36 and 37 and nozzles 55 and 56 are located above the web 9 and spray etchant from above the web while the lower nozzles 53 and 54 spray from beneath the article. The sealing apparatus shown in FIG. 1 is located in etching stations 31, 32 and 33 to prevent the etchant spray from nozzles 50, 51 and 52 from passing around the web and onto the top of the web as it passes through the successive etching stations.

As the web leaves etching chamber 33 there is provided a squeegee or wiping member for wiping clean the resist layer before it enters etching chambers 36 and 37. The squeegee removes any liquid or water or other material which may be on the web before entering etching chambers 31, 32 and 33. The wiping unit comprises a large diameter roller 40, a support member 43 which is mounted to the chamber and a pair of squeegees 41 and 45 which are held in pressure contact with web 9 by a pair of springs 42 and 46. These squeegees wipe off and clean the top of the resist layer so that the top side of the web is ready for the final etching in etching chambers 36 and 37.

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While the preferred embodiment shows the guide members separate from the air bags, it is envisioned that the bottom side of the inflatable bag could be made of a thicker wear resistant material and this eliminates the need for separate flexible sealing members.

I claim:

1. An apparatus for isolating one face of a continuous web from attack by etchant while allowing the opposite face of the web to be attacked by an etchant as the web passes through an etching chamber, comprising:

an etching chamber for directing etchant at one face of a web;

means located in said etching chamber for supporting the opposite edges of said web including a first pair of sealing members for contacting the edges on one face of said web; and

flexible sealing means for coating with said first pair of sealing members for sealing the edges of said web between said first pair of sealing members and said flexible sealing means to thereby provide a barrier to etchant leaking past the edges of the web.

2. The invention of claim 1 wherein said flexible sealing means includes a second pair of flexible sealing members for contacting the edges located on the opposite face of said web.

3. The invention of claim 2 wherein there is included a roller and squeegee for wiping off the web.

4. The invention of claim 2 wherein said flexible sealing members comprise polytetrafluoroethylene.

5. The invention of claim 2 wherein said flexible sealing means include an air inflatable bag.

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